AHFE International

Enabling Data-Driven Collaboration: Leadership, Culture, and Knowledge Management in the Digital Enterprise

Alexander Nedelchev[1], Vinzenz Krause[1], Stefan Niggl[1], and Sebastian Smerat[2]

[1]Biberach University of Applied Sciences, Karlsstrasse 6-11, 88400 Biberach, Germany
[2]thyssenkrupp Materials Services GmbH, thyssenkrupp Allee 1, 45143 Essen, Germany

ABSTRACT

As organizations pursue data-driven goals, transforming into data-driven organizations (DDOs) has become key to achieving sustainable competitive advantage through better decisions, innovation, and efficiency. At the core of this shift lies the data-driven culture (DDC), which enables organizations to treat data as a strategic asset. This paper explores how leadership, organizational culture, and knowledge management interact to build such a culture. While advances in data technologies have expanded data's availability and value, true transformation depends on embedding data-driven thinking across all levels. Drawing on interdisciplinary literature and expert interviews within a German multinational, the study identifies enablers and barriers to DDC implementation, emphasizing leadership competencies, cultural alignment, and collaborative knowledge processes. The findings highlight that effective leadership and adaptive culture—supported by structured knowledge sharing—are essential for successful data-driven transformation and long-term competitiveness.

Keywords: Data-driven organization, Leadership, Organizational development

INTRODUCTION

In today's dynamic, technology-driven business environment, organizations face increasing pressure to transform themselves into data-driven enterprises. This transformation is no longer optional but essential for achieving competitive advantages, fostering innovation, and enabling data-informed decision-making (Lee et al., 2024; Li et al., 2022). Declining costs of IT infrastructure for data collection, storage, and processing, along with the enhanced performance of emerging technologies and evolving internal processes, have accelerated the adoption of big data analytics across all departments. This trend promotes 'data democratization' throughout organizations (Awasthi & George, 2020; Lemmon & Lemmon, 2013). Despite major technological progress, becoming a data-driven organization (DDO) demands profound organizational and cultural transformation. Establishing a data-driven culture reshapes shared values, norms, and attitudes, placing data at the center of decision-making. Particularly in times

of transformation, leadership plays a critical role in fostering a culture of learning, embracing new technologies, and encouraging cross-functional collaboration by dismantling organizational silos (Hupperz et al., 2021; Schmidt et al., 2023). Several studies highlight that leaders often perceive cultural barriers as the most significant obstacles on the path toward a DDO (Bean, 2022). Leaders not only shape organizational culture but are also embedded within it. At the same time, managers must keep pace with technological progress, as their roles and responsibilities evolve alongside it. The study applies socio-technical systems (STS) theory, which emphasizes that the technical subsystem must be jointly considered and optimized together with the social subsystem, and vice versa (Clegg et al., 2017; Trist & Bamforth, 1951; Trist, 1981). Our focus lies on the people and cultural dimensions of the STS framework and their interactions with other elements within the system. The paper aims to explore the multifaceted role of leadership, culture and knowledge management and to provide an overview of current research on data-driven organizations. By conducting a systematic literature review we answer our first research question (RQ1): How is the role of leadership, organizational culture, and knowledge management described in the data-driven organization literature? Secondly, we conducted 16 expert interviews to answer our research question (RQ2): What insights can be gained about the impact of leadership on stemming from a data-driven collaboration within a multinational company? The paper is structured as follows: first, we outline the theoretical foundation and research approach; next, we present the results of the qualitative expert interviews.

THEORETICAL BACKGROUND

This study is grounded in socio-technical systems (STS) theory (Trist & Bamforth, 1951), which conceptualizes organizations as systems composed of interdependent human and technological components (Leavitt et al., 1964; Trist, 1981). Within this framework, the social subsystem encompasses the dimensions of people, culture, and organizational goals, while the technical subsystem includes infrastructure, technology, and processes (Clegg et al., 2017). These dimensions continuously interact with one another, and because the STS is understood as an open system (Bertalanffy, 1950), it also exchanges information and resources with its broader environment (Abbas & Katina, 2023; Emery & Marek, 1962). Each dimension of the STS framework represents a distinct field of research. In this study, particular attention is given to the people and cultural dimensions, with a specific focus on leadership as a pivotal factor in shaping, enabling, and sustaining the transformation toward data-driven organizations. By emphasizing leadership within the socio-technical context, this study highlights how leaders bridge the social and technical subsystems—translating technological potential into meaningful cultural and behavioral change.

RESEARCH APPROACH

To answer our first research question (RQ1), we conducted a systematic literature review (Cooper, 1988; Newbert, 2007; Randolph, 2009). The sample selection process was based on specific criteria, which are briefly

outlined as follows: First, the search string ("data-driven" OR "datadriven" OR "data driven") AND (organi* OR compan* OR firm*) was applied to the Title or Abstract fields. The search was conducted across three databases: Web of Science, EBSCO Host Business Source Complete, and EconLit. Only research articles and review papers were included, while conference papers, books, editorials, data papers, meeting abstracts, retracted publications, letters, and corrections were excluded. Furthermore, the selection was limited to peer-reviewed publications written in English.

To address (RQ2), we employed a qualitative research design. The underlying socio-technical systems (STS) framework encompasses multiple interrelated research areas—such as people, culture, technology, and leadership—for which qualitative methods are particularly well-suited. These methods enable the development, refinement, and validation of theoretical concepts and help uncover complex social dynamics such as collaboration and leadership behavior within organizational transformation processes. We conducted 16 semi-structured expert interviews to complement and expand upon the findings of our literature review, particularly concerning the role of leadership and cross-functional collaboration in establishing a data-driven organization—areas that remain underexplored in existing research (Bogner et al., 2009; Magaldi & Berler, 2018). The interview participants were senior and top-level managers from a multinational German corporation with over 10,000 employees. Their responsibilities spanned organizational development, software development, data analytics, business model innovation, and corporate strategy—fields in which effective leadership and collaboration are key enablers of data-driven transformation. Interviews were conducted both in person and via Microsoft Teams, averaging approximately 70 minutes each. All interviews were recorded, transcribed, and systematically analysed using MAXQDA. We applied a hybrid thematic analysis approach (Fereday & Muir-Cochrane, 2006), combining deductive and inductive coding techniques. In the deductive phase, we employed an initial codebook derived from our theoretical framework. In the inductive phase, new codes were generated from the empirical data to capture emergent themes—particularly those related to leadership practices, collaboration mechanisms, and their influence on socio-technical integration. This iterative process allowed us to identify additional dimensions in the transformation toward data-driven organizations and to analyze how leadership behaviors facilitate collaboration between technical and social subsystems. Moreover, we examined patterns of contextual and experiential knowledge across the four key STS dimensions—people, leadership, technology, and culture—to deepen our understanding of their interdependencies. An autonomous counting approach was also applied to summarize and visualize the full dataset, enabling us to map and interpret findings within the hexagonal socio-technical systems framework for data-driven organizations. While traditional notions of reliability and validity are less applicable to qualitative research, we adopted multiple measures to ensure trustworthiness and credibility, including transparent documentation, systematic coding, and iterative interpretation among researchers. These measures enhance the rigor and confirm the quality of the

study's insights into leadership and collaborative dynamics in data-driven transformation.

Leadership, Culture, and Knowledge Management in the Digital Enterprise

Literature Review

Data-driven organizations (DDOs) are increasingly framed in the literature as socio-technical systems where leadership, culture, and knowledge practices jointly enable analytics to influence decision making and value creation (Szukits, 2024). Scholars emphasize that technical investments alone are insufficient: organizational adoption of analytics depends on managerial endorsement, cultural norms that legitimize evidence use, and knowledge processes that translate analytic outputs into actionable insight (Szukits, 2024; Korherr, 2022). This review synthesizes how leadership, culture, and knowledge management are described as distinct but interrelated enablers in the DDO literature. Leadership is consistently portrayed as a primary catalyst for data adoption. Empirical studies and conceptual frameworks argue that top management support, strategic emphasis on analytics, and a new set of "data leadership" competencies (analytical literacy, data self-efficacy, visioning, and knowledge facilitation) are necessary to mobilize resources, set priorities, and model data-centric behaviors (Schmidt, van Dierendonck, & Weber, 2023; Szukits, 2024). Leadership influences perceived data quality and legitimacy of analytics—two mechanisms shown to mediate the formation of an analytical decision-making culture and subsequent data use (Szukits, 2024). Practical case studies also underline the role of middle and data leaders (analytics translators, champions) who bridge technical teams and decision makers to institutionalize analytics in work routines. Organizational culture is described as both a barrier and an enabler: cultures that reward experimentation, evidence-based reasoning, cross-functional collaboration, and psychological safety facilitate analytic uptake, whereas risk-averse, siloed cultures impede it (Korherr, 2022; Leso et al., 2022). Recent work differentiates an "analytical" or "data-driven" culture from general innovation culture by focusing on trust in data quality, routinized use of analytic outputs in decisions, and norms for sharing metrics across levels (Szukits, 2024; case evidence in MISQE). Culture also shapes governance choices—whether analytics usage is centralized in specialized units or decentralized into business units—and thus determines how insight flows to decision points. Knowledge management (KM) literature complements these perspectives by explaining how organizations capture, codify, and disseminate analytic knowledge so it is usable and retained. Systematic reviews show KM practices (metadata/ontology design, communities of practice, knowledge brokers, and embedding analytics outcomes into processes) are crucial to operationalize insights and prevent loss of tacit understanding (systematic KM reviews; Korherr, 2022). Emerging studies highlight AI-augmented KM and the need for "knowledge facilitation" roles—leaders who translate algorithmic outputs into managerial knowledge—thus linking leadership, cultural norms,

and KM practices into a cohesive capability for DDOs. Gaps remain around longitudinal evidence of capability building and how power dynamics shift as analytics reconfigure decision rights. Future research should therefore pursue mixed-methods longitudinal studies that trace leader behaviors, cultural change, and KM interventions together.

Qualitative Study

Introduction: The People Dimension and the Leadership Challenge
The qualitative, empirical study revealed several conflicting insights within the "People" dimension, which is deeply intertwined with the domain of leadership. Respondents consistently emphasized the critical role of employees—technical experts, managers, leaders, and organizational developers—in enabling the transformation toward a data-driven organization (DDO). One interviewee highlighted that employees must "acquire new skills and competencies to stay relevant to the organization," underscoring the dynamic nature of workforce capabilities in data-centric environments. In contemporary economic systems, data functions both as a production factor and a coordination mechanism. Organizations no longer compete primarily on scale or efficiency but on their capacity to translate information into insight and insight into strategic action. Accordingly, the transformation toward a DDO represents not merely a technological evolution but a profound leadership challenge, one that compels executives to rethink decision-making, accountability, and cross-functional collaboration.

Leadership Tensions: Strategic Vision Versus Organizational Friction
Interviews conducted across multiple leadership levels within the German multinational enterprise revealed a persistent duality. Leaders uniformly acknowledged the economic necessity of becoming data-driven, yet they faced enduring cultural and organizational frictions that impeded transformation. As one leader observed, "We hinder ourselves because we keep treating data as a technical issue instead of a management issue."

This sentiment reflects a recurring dilemma: while leaders grasp the strategic value of data, many lack a coherent leadership framework to translate technological potential into business outcomes. Another interviewee characterized leadership in data transformation as requiring "strategic patience combined with relentless direction," describing years of automation and forecasting projects that redefined decision-making processes. Yet he cautioned that "technology without leadership intent merely optimizes fragments," emphasizing the necessity of leadership vision and intent as integrative forces in the data journey.

Leadership in Practice: Purpose, Patience, and Learning
Interviewees highlighted that leadership in data-driven transformation must be grounded in purpose and regulatory awareness. One leader involved in sustainability initiatives explained: "Two years ago, we realized how few reliable product-footprint data sets existed in the market… leadership had

to decide whether to wait or to build our own database." This example demonstrates decisive leadership in navigating uncertainty and regulatory complexity.

Across cases, a common theme emerged: leadership attention is the scarcest resource in data transformation. "We have ideas and even tools," one participant noted, "but decisions are slow because people with authority are busy firefighting." This framing positions leadership bandwidth, rather than technical limitation, as the central constraint in achieving data maturity.

Leadership Archetypes in Data-Driven Organizations

The qualitative findings revealed three archetypal forms of leadership that underpin successful data-driven transformation.

Directive leadership establishes standards, governance, and accountability—leaders "decide what good data looks like" and enforce compliance. Participative leadership bridges the gap between domain expertise and data science, ensuring that "a dialogue between domain knowledge and data science" informs decisions. Stewardship leadership treats leaders as custodians of organizational knowledge. As one interviewee stated, "If one expert leaves and we lose the know-how, we are not a data-driven organization; we are a personality-driven one."

Together, these archetypes highlight that data-driven transformation demands a portfolio of leadership roles—visionary, facilitator, and guardian—rather than reliance on a single style.

Collaboration as an Economic and Cultural Imperative

A consistent insight across interviews was that technical integration without social integration fails. As one leader put it, "Even if every system talks to each other, the people often don't." Misaligned incentives, departmental silos, and mistrust were cited as key barriers. An interviewee from e-commerce illustrated this challenge: marketing analytics, CRM, and logistics data were each optimized locally, resulting in inconsistent forecasts and pricing. The consequence was economic inefficiency—"double marginalization"—where each unit made suboptimal decisions based on incomplete data.

This finding underscores that collaboration is not a "soft" factor but an economic necessity that reduces transaction costs and information asymmetry. Collaboration aligns incentives and transforms fragmented technical potential into collective performance.

The Collaborative Mindset and Psychological Safety

Several interviewees stressed that collaboration must be cultivated as a mindset rather than a formal structure. One leader highlighted the value of a "growth mindset," remarking that "when someone points out an error in your data, it's not an attack—it's an opportunity to improve." Such psychological safety fosters data transparency and prevents defensive behavior.

Others linked collaboration to talent and organizational design. One interviewee argued for embedding analysts within business units instead of centralizing them, contending that "you can't collaborate on data if only a handful understand it." This distributed model supports the

principle of information locality—ensuring that decisions are made where contextual knowledge resides, while maintaining coordination mechanisms for organizational coherence.

Leadership and Collaboration as Mutually Constitutive

The study revealed that effective collaboration rarely emerges spontaneously; it must be intentionally architected by leadership. As one participant stated, "Without someone setting the rules of the game, collaboration becomes polite chaos." Leadership thus operates on both the technical and social dimensions of coordination—defining governance, ownership, and performance metrics while fostering trust, shared purpose, and interpretive alignment.

Several leaders emphasized the evolving role of executives as "supervisors of the algorithm," overseeing both human teams and socio-technical systems. Others envisioned leadership as inherently collaborative, describing leaders as "connectors of expertise." One interviewee noted, "Data literacy should sit in every manager's toolbox," aligning with the concept of modular organizations, where decentralized decision rights reduce information bottlenecks. Yet participants also warned that "decentralization without common standards leads to many clever islands but no continent," underscoring the need for narrative coherence and unified strategic vision.

Economic Mechanisms of Value Creation

Viewed through the lens of organizational economics, three mechanisms emerged by which leadership and collaboration create tangible value:

1. Reducing information asymmetry through transparent cross-unit collaboration that aligns incentives and enhances responsiveness.
2. Enhancing dynamic efficiency by institutionalizing experimentation and learning, transforming failure into organizational knowledge.
3. Building intangible capital by cultivating trust, reputation, and data stewardship, which strengthen relational and reputational capital.

As one leader insightfully remarked, "A good leader does not just manage people or machines—he manages the cost of misunderstanding." This statement encapsulates the economic essence of data-driven leadership: reducing the transaction costs of coordination and interpretation.

Persistent Barriers to Transformation

Despite significant progress, the study identified several enduring barriers to data-driven transformation.

- Fragmented systems and redundant initiatives, such as multiple data lakes and inconsistent ERP structures, increase complexity.
- Limited leadership bandwidth prevents long-term investment in data governance.
- Cultural inertia manifests as resistance to transparency, often perceived as surveillance rather than empowerment.
- Skill scarcity, particularly of data translators and hybrid professionals, hinders the diffusion of best practices.

These barriers collectively slow the institutionalization of a mature data-driven culture and highlight the multidimensional nature of the leadership challenge.

Leadership Responses and Future Outlook

Participants emphasized that overcoming these barriers requires leadership action on two temporal horizons: short-term empowerment through rapid experimentation and cross-functional initiatives, and long-term institutionalization through governance, capability-building, and cultural reinforcement. One leader summarized this imperative succinctly: "We need leaders who don't fear what the data might reveal."

Leadership, in this context, provides direction, legitimacy, and prioritization, while collaboration provides connectivity, interpretation, and resilience. Together, they form a learning system capable of self-correction—an essential property of modern industrial firms.

In the German multinational case, leaders converged on a common belief: data is not the end goal—better decisions are. Becoming a data-driven organization means developing the leadership capacity to interpret data economically, ethically, and collaboratively. As one interviewee concluded: "If we can make knowledge reusable across people and systems, we are not just efficient—we are intelligent."

Ultimately, leadership plays a pivotal role in building trust, promoting a culture of data-driven decision-making, and guiding employees through the technological transition. Transparent communication, continuous learning, and a commitment to valuing human expertise alongside automation are indispensable to ensuring that technology enhances, rather than replaces, organizational intelligence.

CONCLUSION

This research confirms that building a data-driven organization is primarily a leadership challenge rather than a technical one. While advanced analytics and AI tools expand informational capacity, the decisive variable is leadership's ability to integrate these technologies into coherent cultural and collaborative practices. The qualitative analysis revealed that leaders must not only set strategic direction but also cultivate trust, psychological safety, and data literacy throughout their organizations. They must navigate the tension between control and empowerment—providing structure without stifling creativity—and ensure that employees see data as a shared asset rather than a surveillance mechanism. The study also emphasized the importance of sustained investment in people: continuous learning, transparent communication, and the recognition that digital transformation requires both technical upskilling and emotional resilience.

Collaboration emerged as the second pillar of successful transformation. Effective leaders design interaction architectures that bridge silos, align incentives, and convert dispersed expertise into collective intelligence. By doing so, they reduce information asymmetry and transaction costs, creating value that extends beyond technology itself. Ultimately, leadership

and collaboration form a self-reinforcing system: leadership provides purpose and legitimacy, while collaboration operationalizes that vision through shared practice. The findings contribute to the literature on socio-technical integration by showing how leadership behaviors can translate digital potential into organizational intelligence, resilience, and long-term competitiveness.

REFERENCES

Abbas, H., and Katina, G. (2023). Socio-Technical Theory: A review, in: TheoryHub Book, Papagiannidis, Savvas (Ed.).

Awasthi, P., and George, J. (2020). A Case for Data Democratization, in: AMCIS 2020 Proceedings. Atlanta, GA.

Barbala, A. M., Hanssen, G. K., and Sporsem, T. (2024). Towards a common data-driven culture: A longitudinal study of the tensions and emerging solutions involved in becoming data-driven in a large public sector organization. Journal of Systems and Software, 218. https://doi.org/10.1016/j.jss.2024.112185.

Bean, R. (2022). Why Becoming a Data-Driven Organization is so Hard. Harvard Business Review Digital Articles, 1–6.

Bertalanffy, L. von (1950). An Outline of General System Theory. The British Journal for the Philosophy of Science, 1(2), 134–165.

Bogner, A., Littig, B., and Menz, W. (2009). Interviewing experts. 1st ed. New York: Palgrave Macmillan.

Chatterjee, S., Chaudhuri, R., Gupta, S., Sivarajah, U., & Bag, S. (2023). Assessing the impact of big data analytics on decision-making processes, forecasting, and performance of a firm. Technological Forecasting and Social Change, 196, 122824.

Clegg, C. W., Robinson, M. A., Davis, M. C., Bolton, L. E., Pieniazek, R. L., and McKay, A. (2017). Applying organizational psychology as a design science: A method for predicting malfunctions in socio-technical systems (PreMiSTS). Design Science, 3. https://doi.org/10.1017/dsj.2017.4.

Cooper, H. M. (1988). Organizing knowledge syntheses: A taxonomy of literature reviews. Knowledge in Society, 1(1), 104–126. https://doi.org/10.1007/BF03177550.

Emery, F. E., and Marek, J. (1962). Some Socio-technical Aspects of Automation. Human Relations, 15(1), 17–25. https://doi.org/10.1177/001872676201500102.

Fereday, J., and Muir-Cochrane, E. 2006. Demonstrating Rigor Using Thematic Analysis: A Hybrid Approach of Inductive and Deductive Coding and Theme Development. International Journal of Qualitative Methods, 5(1): 80–92.

Hupperz, M., Guer, I., Moeller, F., and Otto, B. (2021). What is a Data-Driven Organization? Completed Research, in: Digital Innovation and Entrepreneurship (AMCIS 2021).

Korherr, P., Kanbach, D. K., Kraus, S., & Mikalef, P. (2022). From intuitive to data-driven decision-making in digital transformation: A framework of prevalent managerial archetypes. Digital Business, 2(2), 100045.

Leavitt, H. J., Cooper, W. W., and Shelly, M. W. (1964). New Perspectives in Organization Research. New York: Wiley.

Lee, V. H., Dwivedi, Y. K., Tan, G. W., Ooi, K. B., and Wong, L. W. (2024). How does information technology capabilities affect business sustainability? The roles of ambidextrous innovation and data-driven culture. R&D Management, 54(4), 750–774. https://doi.org/10.1111/radm.12596.

Lemmon, E. M., and Lemmon, A. R. (2013). High-Throughput Genomic Data in Systematics and Phylogenetics. Annual Review of Ecology, Evolution, and Systematics, 44, 99–121. https://doi.org/10.1146/annurev-ecolsys-110512–135822.

Leso, B. H., Cortimiglia, M. N., & Ghezzi, A. (2023). The contribution of organizational culture, structure, and leadership factors in the digital transformation of SMEs: A mixed-methods approach. Cognition, Technology & Work, 25(1), 151–179.

Schmidt, D. H., van Dierendonck, D., and Weber, U. (2023). The data-driven leader: Developing a big data analytics leadership competency framework. Journal of Management Development, 42(4), 297–326. https://doi.org/10.1108/JMD-12–2022-0306.

Szukits, A., and Móricz, P. (2024). Towards data-driven decision making: The role of analytical culture and centralization efforts. Review of Managerial Science, 18(10), 2849–2887. https://doi.org/10.1007/s11846–023-00694–1.

Trist, E. L. (1981). The Evolution of Socio-technical Systems: A Conceptual Framework and an Action Research Program. Toronto, Canada: Ontario Ministry of Labour, Ontario Quality of Working Life Centre.

Trist, E. L., and Bamforth, K. W. (1951). Some Social and Psychological Consequences of the Longwall Method of Coal-Getting: An Examination of the Psychological Situation and Defences of a Work Group in Relation to the Social Structure and Technological Content of the Work System. Human Relations, 4(1), 3–38. https://doi.org/10.1177/001872675100400101.